ILLUSTRATED CATALOGUE

—OF THE—

Interior Conduit

AND

Insulation Company,

16 & 18 Broad Street,

NEW YORK.

1/4"
3/8"
5/8"
3/4"
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EDWARD V. BROKAW,
PRINTER,
54 BROAD STREET,
NEW YORK.

A NEW AND SUPERIOR

SYSTEM

FOR THE

ELECTRIC WIRING

OF

BUILDINGS.

Suitable for any System of Electric Lighting, High or Low Tension.

THE WIRING SYSTEM AND METHODS

OF THE

INTERIOR CONDUIT AND INSULATION CO.

If the question be asked: What is the greatest advance made during this century in the comfort, convenience and beauty of public and domestic interiors? there is but one answer possible—the introduction of the incandescent electric light. No sooner did the invention take practical and commercial shape than it at once appealed to the highest and most refined instincts of a cultivated people. It suggested new possibilities to the architect and decorator. It gave to its patrons a softer, steadier light, that soothed the eye and could be placed at will wherever need or fancy dictated. It saved choice pictures from decay, rescued books and tapestries from smudge and rot, and left paint and metal in their pristine freshness. It did not taint or vitiate the air, but brought with its cheerful ray a gentle exhilaration that might well be classed with its more direct hygenic benefits, so that not only did it promote the cleanliness that comes next to godliness, but was hailed as the very type and embodiment of the ideal "sweetness and light."

In no respect has the incandescent light fallen short of its purpose as the boon that the popular imagination at once foresaw. It has proved to be that refinement of artificial illumination where simplicity has become the last expression of ingenuity and invention. Every one recognizes its foremost position among the gifts of scientific discovery to our age. Already the criticism that it is a luxury is hushed, for it has been brought within the reach of everybody. A luxury is only a necessity that some cannot afford.

But, while this is so true that there is no longer any need to emphasize or enlarge upon it, the fact remains that until a very recent date the methods of introducing the electric circuits, to convey current into buildings of whatever class, have been crude and barbarous in the extreme. The dynamo has been brought to the highest state of efficiency; the lamp has a longer life and a greater brilliancy than ever; the arrangements for carrying the current all over a large district are scientific and successful; but when we come to the details of interior wiring they are often found to be such that one wonders how it is that the light has survived and made its way in spite of them.

We go into one of the large new office buildings that are among the finest ornaments of modern New York. We see a dozen men at work around the different floors, annoying tenants in the endeavor to get current to the lamps. We are told that no fewer than 20 or 30 leakages developed immediately when the current was turned on, and that new troubles occur daily. The wires are out of sight, but are all laid in the plaster, and every effort to get at them involves a destruction of walls, decorations and woodwork. Many of the ceilings look as though Mercator's projection of the world had been drawn on them, and some of the fixtures suggest that a water pipe had burst near by, so stained and cracked are the walls where the cut was made to reach defective insulation. The owner is in despair, the architect ashamed of the wiring contractor and the casual but observant public makes one more note against the poor science of electrical insulation and installation.

We go up town in New York, and step into one of the palatial homes of the residential quarter. The electric light has been introduced, but at what a price! This beautiful frescoing is irretrievably damaged; that handsome wall is greatly disfigured by heavy, clumsy cleats and mouldings, and the whole house has been dealt with in such a way by the wiring men that the occupants literally wring their hands in despair, and they cry out

indignantly that even such a blessing as the electric light may be had at too great a cost. They are fortunate if, after a while, the work does not develop serious defects and require to be done again from beginning to end.

These are not exaggerated cases. Every electric lighting man knows that such instances abound. In fact, there is no help for them unless some system be provided and offered that will enable interior wiring to be done in a scientific manner. If the methods hitherto employed are indeed the final ideas that electrical invention has to offer on the subject of interior wiring, then gas will not only die hard, but be a long time doing it.

Moreover, as matters have stood hitherto, the greatest difficulty has arisen in regard to the wiring of the new buildings that are as yet remote from central stations. The owner has not cared to go to the expense of placing circuits that may not be utilized for a long time to come, and which when he requires them may prove useless, and as he looks at other fine structures that have been hacked to pieces in the effort to render their wires available, he hesitates to subject his own property to such treatment.

Is there no remedy for this discreditable condition of affairs? Must wires still go into the plaster, and if they are grounded or in need of reinforcement of any kind, must the walls be torn asunder? Must the wires still run haphazard, as crooked as the streets of Boston, and be hidden under tasteless mouldings that are often as dangerous as they are ugly? Cannot architects be enabled to lay out their plans for the inclusion of the lighting wires and other classes of circuits as systematically, as intelligently, and as comprehensively as they do for water, gas, or steam?

In answer to such vital questions, we are able to state that a system has been ingeniously worked out which avoids all these difficulties, brings interior wiring up to the high scientific and technical standard

already attained by the other branches of electrical service, and which with the enthusiastic admiration of every electrician, architect, builder, fire underwriter or real estate owner to whom it is shown. The advance in the art is so great that when once the system is explained, nothing on an office plan will be tolerated, the advantages believe; and there is nothing, the great practical recommendation that the system affords economy and saving as compared with the older methods. The system in question is that of the Interior Electrical Conduit Company, of New York, and its many advantages are the result of a long familiarity with the difficult conditions existing, coupled with great ingenuity in the production of details and special devices, all harmonizing with the requirements of the most rigidly practical and scientific judges.

Briefly stated, the system of the Interior Electrical Conduit Company consists in the use of a light flexible tubing, or conduit, which is carried through a building, pretty much as gas pipe or water pipe is, and which serves as a duct or repository for the insulated wires. The peculiar nature and advantages of the work will, I think, be best illustrated hereafter.

The plan is so simple when worked out that the very absence of complexity serves to hinder a quick appreciation of its remarkable utility. At a first inspection, it is nothing short of revolutionary, yet the ease with which it can be applied to any class of work secures its immediate and universal adoption. But the idea of the tube or conduit (as combined, or associated with it the use of a new and ingenious fastener were known as the "safety condenser." These special features are, in turn, the appropriate and adequate complements of a possible "system of distribution." As the result of the perfect relation of these three elements, the comfort, the safety combine with the system of distribution, we have five cardinal points, not of simple superiority, but of absolute necessity, without any one of which interior wiring

tends to become the failure above portrayed. These five points are: 1, *Safety;* 2, *Convenience;* 3, *Accessibility;* 4, *Economy;* and 5, *Durability.*

A brief consideration of each of these will bring out clearly in a most interesting manner the essential and fundamental features of the system. It is needless to add that there are many corollaries to these main advantages, but with such important points established, the reader will be quick to grasp the others for himself.

1. *Safety.*—The whole business of insurance is founded on the idea of safety. If the electric light in his house or property is not safe, no man wants it; and even if he wants it, the underwriters will be prompt to interpose their "Thou shalt not," under penalty of the loss of all insurance. No reason exists why the underwriter should lend an ear to any argument save that of absolute safety. With him no pleas of convenience or economy can weigh; in fact, he is apt to regard such recommendations with suspicion if they be not prefaced and reinforced with the vital condition of freedom from danger. Moreover, we find at once the explanation of the frequent reluctance of the underwriter to insure this or that building. The work he is called upon to approve is so bad that he wonders what has become of the contractor's self-respect. It is true that the inspector certifies it, but his heart misgives him, not only as to the risks of "grounds" in the walls and "short circuits" in the mouldings, but as to the very nature of the wire that all depends on. Everything is boxed up and plastered up; it cannot be seen in its entirety without worry, expense and great annoyance; and so, after much reflection, he takes the chances reluctantly, with a prayer to the "sweet little cherubs up aloft," not knowing how soon the mistrusted wire may begin eating its own vitals out and then start a fire to conceal its suicide.

Let us compare this with the methods of the Interior Electrical Conduit Company. The tube used is made of a species of paper or papier mache, and combines flexibility

with great power of resistance to strain. After it has been made by special process it is subjected to treatment with some secret bituminous, asphaltic compound that renders it thoroughly non-conducting and impervious to moisture. The tube when cut with a knife exhibits every evidence of complete impregnation, and stubbornly resists every attempt to permeate it with water. This tube is made in sizes of ½ inch to 1¼ inches inside diameter, and in lengths of 10 feet. These lengths are joined together by sleeve couplings and are threaded and can be right angled or be fitted with elbows for running curves and corners. Here at once, in such a tube, we have, beyond the mechanical shield from injury, such a protection against internal or external fire as has never before been provided. Within such a tube ordinary wire may be run with impunity, and whatever may occur the result is confined within the tube. In order, however, to insure positively the operation of the safety devices employed in electric circuits, this conductor is based on the sound, irrefutable principle, that if there is to be a short circuit it were well to have it occur as quickly as possible and within confined limitations. In this conductor, the two conductors composed of stranded copper wires are separately insulated, then laid up together and jacketed in a common sheathing of suitable material. Thus, while the wires are normally and properly insulated, there is no absolute bar to a short circuit; but, instead of provocation to slow smouldering, there is an instantaneous compulsion to short circuits and blowing of the safety fuse, so that the trouble must instantaneously declare itself and disappear. The conduits, it may be added, all lead safely and snugly into main junction boxes, while smaller junction boxes, intersection boxes, and outlet terminals make safe, elegant and ample provision for the ramifications and convenience of the service.

It seems superfluous to point out how superior this method is to anything that has gone before. We leave behind us at one stride all the crude and cumbersome

devices of the early stages of the art, and instead of bad work done without plan, and attended by the use of iron staples, wooden mouldings and the like, we get a scientific system of predetermined channels, built up of safety tubes, wherein the nature and quality of the wire and its insulation may be immediately and frequently ascertained, and where the use of the safety conductor practically places a double guard and protection on every circuit. Should the safety fuses fail to act, as they may, and frequently do, in other systems, the safety conductor is there to "watch the watchman" and to repel at once the impending danger. It is impossible, therefore, that the system of the Interior Electrical Conduit Company should fail to receive the hearty indorsement of any insurance expert who has examined and tested it. Its grand, foremost merit is that of safety.

2. *Convenience.*—If we look at any house or building wired on the old plan, we are struck at once with the absence of the element of convenience. If the wire is laid into the plaster, the wiring contractor, in order to guard his work from injury, has to dance a weary attendance on a number of masters and men, whose chief solicitude seems to be that of making his life a burden, and his profit *nil*. He has no convenience whatever for the execution of the work, which suffers proportionately to the lack of facilities and of close supervision. The same is true of wires run in moldings. Yet in the present condition of affairs one can hardly blame the architect and builder. They know how to deal with a system of gas pipes, steam-pipes, and water pipes, but when it comes to making provision for wires, which may be led anywhere at the sweet will of the successive persons in charge of an installation, they shirk the job in disgust or despair. But the new system changes all this, as every architect of ordinary attainments is familiar with methods of disposing of piping in his plans. He has something definite to deal with. He can carry the whole system in his mind before he puts a line on paper. He can follow out every part of the distribution in a syste-

matic way, and instead of being repelled by the apparently endless difficulties of electric lighting, is encouraged to make ingenious plans that shall fit the requirements of the case. It is doubtful, therefore, whether the underwriter or the architect will extend the warmer welcome to the system of the Interior Electrical Conduit Company.

Moreover, the convenience afforded is seen again in the ease with which any interference with decorations is avoided. If a building be electrically conduited there is an absolute avoidance of subsequent vandalism in tearing down woodwork, breaking into walls and ruining choice frescoes, papers, or lincrustas. Striking finished examples of the convenient and flexible application of the system are found in the city residence of Mr. J. Pierpont Morgan, and in the new country residence of Mr. Wm. Rockefeller, at Tarrytown. In the former instance, the system of tubing has been installed in substitution of old wiring in such a skilful manner that no trace of its presence can be detected; yet it is so thorough and complete that every foot of wire supplying 600 incandescent lights has been easily inserted and every foot can just as easily be withdrawn, in spite of the many bends and devious turnings that some of the tubes are compelled to take. The gain in this respect over old methods is as enormous as that afforded by a steam track compared with a muddy farm lane in winter, or by an electric over a horse road. It is worthy of note, too, that in the lower servants' hall of the house the tubing has been carried exteriorly along the ceiling from lamp to lamp, and bronzed so that it looks like a handsome run of metal pipe, the real nature and use of which would not be suspected.

In the other example mentioned—the country seat of Mr. Rockefeller—all the wires likewise run through tubing, from the cellar to the topmost room and outlook; and the changes of architectural plan or decorative effect made from time to time in the course of interior construction have been skillfully and

promptly met, as they could be in no other way, by a redisposition of the conduits. One novel piece of work is that connected with a massive stone driveway or approach. Along the buttressed wall are placed posts for incandescent lamps, and each of these is reached through long sections of the conduit that lie in the chaneled parapet. Thus right in the solid stone masonry is an element-tight conduit, through which, controlled from the house, the wires run out of sight, yet immediately accessible for inspection, repairs or enlargement.

Reference has been made above, in passing, to the definiteness given to plans for wiring. In this connection, under the head of "Convenience," mention must be made of the basic principles adopted. These are the subject of a broad patent, and belong to the scientific evolution of the art of electrical distribution. A common practice in wiring large buildings, has been to adopt the "circulation" method, which consists broadly in running the main connector clear through from the dynamo to the last floor, and taking off a feeder at each floor to supply the lamps. There are many objections to this method, such as drop in voltage, increase of heating in the wires, abnormal breakage of lamps, and a general uncertainty as to the location of the controlling points of the system, so that "cut and try" methods often result in sorry work when testing out trouble becomes necessary. In the "distribution" method which is employed by the Conduit Company under its patents, everything is worked out scientifically and systematically, and the various parts fall into their places like the different divisions of a well organized machine. The "distribution" idea is to wire to centres, or distributing points midway in the installation, so that, starting with the main feeders, the whole system, down to the last lamps, is one of equalized pressure, perfect balance, and, therefore, of successful working. As a natural corollary of this method, the junction boxes, switches, cut-outs, etc., which are all of handsome design, find convenient

and presently familiar, places on each floor, under lock and key if desired, but as easy to reach as the hat-rack or the water-cooler. It follows also that all branches and taps, in such a system, are taken off in definitely ordered places and at a right angle or curve, and do not run, as they so often have, in such a manner as to suggest that the object of the wireman was to lose all track of their location. No system will long prevail unless it is right in conception and systematically carried out. The "distribution" idea confidently claims this distinction.

3. *Accessibility.*—The system of the Interior Electrical Conduit Company is pre-eminently one which provides for the future; in fact it is unique in this respect, as there is no other that does. The absence of this quality in previous methods has been one of the drawbacks of electrical work generally, but the public now know enough of the needs of the art not to be misled by the sophistries of exploded methods, and they will not allow it any more than they would allow like pernicious practice in the matter of gas or water supply. It is too apparent to them, that in the new system every inch of wire can be drawn in and out, and the carrying capacities of the circuits be increased at any time in accordance with the requirements of a tenant or with any other exigency that may arise. Nor is this all Hundreds and thousands of fine houses and buildings in all parts of the country are now going up remote from centres of supply. It seems a shame not to wire them, yet it is not less a risky extravagance to do so unless they are within some lighting area where the light is immediately available. The result is that in the vast majority of instances they go unwired, and the very fact that they are thus unprovided with wires is a hindrance to the adoption of the light when the opportunity for obtaining it actually arrives. Now, with the adoption of the system in question, any new building can be supplied with its interior conduits at a mere nominal cost, and thus be placed in condition to receive

the wires without annoyance or delay when the boon of incandescent lighting is within reach. In these days of rapid development in electrical enterprises, this moment is apt to come sooner than the builder has anticipated, and it is extremely important, not only to him but to the local electrical service companies, that this preliminary step should have been taken. To many a householder and owner of large edifices, the mere knowledge that these buildings are conduited, and that the wires can be drawn in at once without trouble or damage to the property, will be an inducement to the introduction of the new illuminant.

4. *Economy.*—One of the first questions asked with regard to improvements and new apparatus is, "What will it cost?" Happily this question is one that can be most satisfactorily answered in behalf of the system of the Interior Electrical Conduit Company. The material of which the conduit is composed is of the most inexpensive character, and the processes to which it is submitted have already been so ingeniously worked out that the element of labor has been reduced to a minimum. Hence the conduit is of established cheap production, and it is further claimed that the safety conductor used with it is less expensive than the two singly insulated wires hitherto employed. The work of putting up the conduit is simple and easily learned, and requires but a small degree of expertness in those who have to insert wires in them. This not only applies to the original work of installation, but even in a greater degree to the work of subsequent changes or renewals of the circuits.

5. *Durability.*—Many of the points of value in the system sum themselves up in the great recommendation of durability. This is implied in the very nature of the materials used, and in the broad idea of the system which offers a permanent enduring conduit into which, to-morrow or ten years hence, with equal freedom, safety, economy and convenience, a complete set of conductors may be drawn. The permanence of the wires themselves is also added to immeasurably, for

they are protected from mechanical injury as never before, and are also exempted from the deteriorating effects of moisture, gases, etc. Year in and year out, the system will go on doing its work as solidly as though it were an integral part of the building, and yet so accessible that in a moment any wire at any point in the whole network may be reached for ocular inspection.

A system so flexible as this is capable of a variety of applications, and some of them are illustrated herewith as examples. The conduit itself is also susceptible of ornamental treatment, if necessary, and may be painted or even electro-plated in any metal, and remarkable decorative effects produced. It is noteworthy, too, that the conduit possesses marked advantages as a speaking tube, and that in this department alone it is expected to gain pre-eminence, being cheaper than metal, and at the same time being perfectly smooth inside and free from the seams and joints that impair the transmission of sound through metal tubes.

DIRECTIONS FOR PLACING SAFETY TUBING.

1. Use as long pieces as posssible.

2. Ream out the ends smooth and cut square.

3. Fasten to walls or beams with staples, using a staple driver to drive them home so that no damage is done to the tube.

4. In making joints use great care, as a tight joint keeps out moisture. Heat the compound made for the purpose until it flows freely, then apply enough to the tube, about one-half inch from the end of it, to fill the space between the tube and the coupling, and while the compound is still soft force on the coupling half way with a rotary movement. This will force out at the end of coupling enough compound to "wipe" the joint smooth and neat. Then apply the compound in the same way to the next length of tubing and force it into the coupling until the ends butt squarely, and "wipe" the joint as before, using care that none of the compound gets over the ends of the tube to make a rough inside joint.

5. Be sure the ends of the tube are so cut as to *butt* squarely at the joints to *prevent* the wires from catching and allow them to pass *freely* without friction.

6. Always *enter* the tubing about $\frac{1}{4}$ of an inch into the junction box, when junction boxes are used, and "wipe" with compound.

7. If too many elbows occur in laying the conduit to reach a desired outlet to prevent the fishing wire being easily pushed through them, put a straightway junction box in the line and insert the wire each way from it.

8. If rigid conductors are used place a junction box at each angle.

In all cases powdered soapstone should be blown into the tube after same is in position.

If these directions are strictly followed you will have an absolutely waterproof conduit, and will have *no trouble* in drawing the electric wires, by means of a fishing wire, through long distances and around corners.

When the screw joint is used the above directions will also apply; the compound for this being more of a lubricating nature it can be more easily used, but the joints must be wiped as directed.

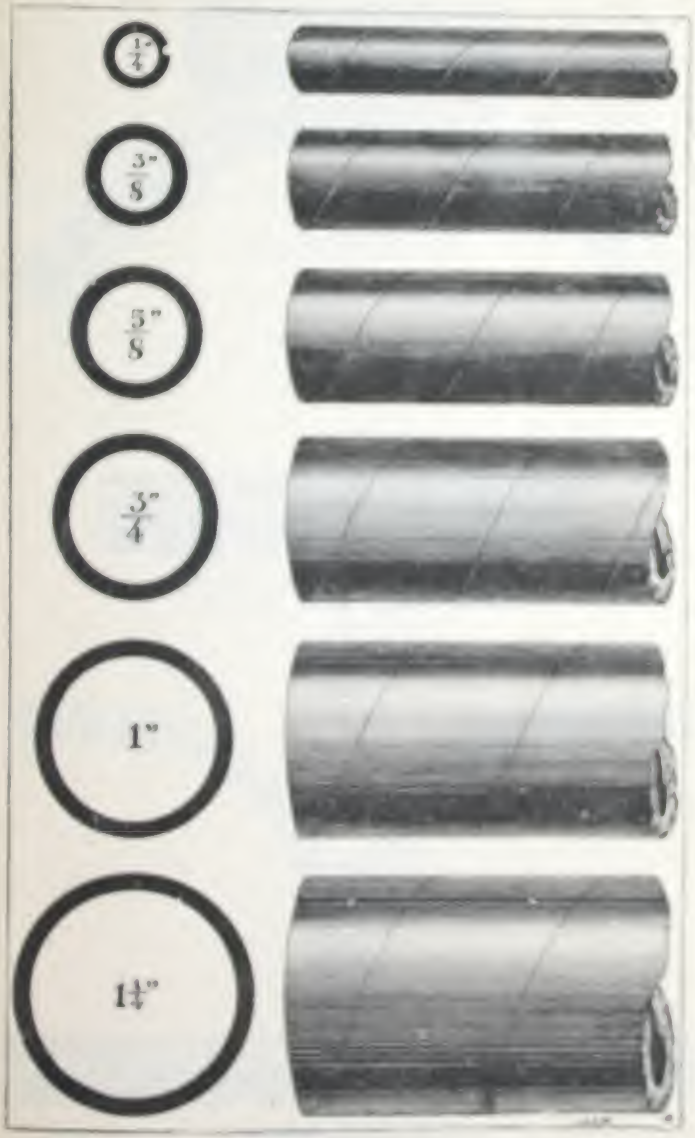


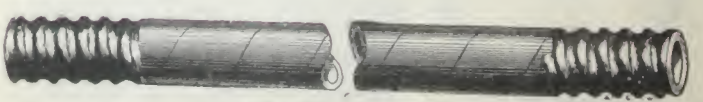
FIG. 1.—The conduits are made in the above sizes, viz.: ¼ inch, ⅜ inch, ½ inch, ⅝ inch, ¾ inch, 1 inch and 1¼ inch inside diameter.

THREADED COUPLING.

FIG. 2.—These couplings are made of metal and enameled—thus making a thoroughly insulated and moisture proof joint.

SECTIONAL VIEW OF SCREW JOINT WITH COUPLING IN POSITION.

FIG. 3.



SECTION OF CONDUIT.

FIG. 4—Shows the threaded end of conduit as used with threaded screw coupling.

FIG. 5.—Illustrates the elbow for turning right angles.

FIG. 6.—Illustrates the double elbow.

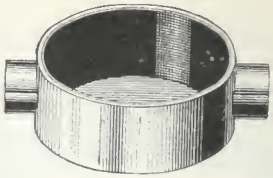


FIG. 7.

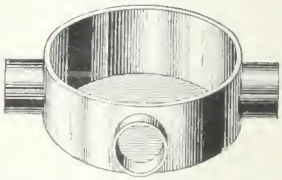


FIG. 8.

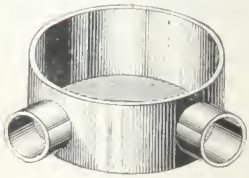


FIG. 9.

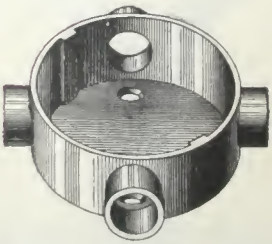


FIG. 10.

Figures 7, 8, 9 and 10 illustrate the four kinds of intersection branch junction boxes used in our system.

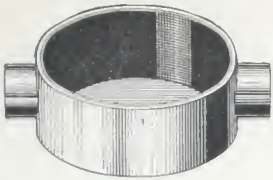


Fig. 11.

Fig. 12.

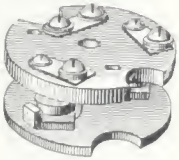


Fig. 13.

Figures 11, 12, 13, illustrate the use of two-way intersection box with cover and fibre base as used for flexible pendant as shown in figure 14.

Fig. 14.— Illustrates the flexible pendant in position and combines figures 11, 12, 13, and 15.

FIG. 15—Illustrates use of conduit as handle for lamp on flexible pendant.

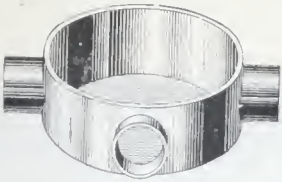


FIG. 16.

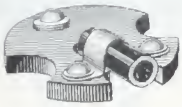


FIG. 17.

FIG. 18.

Figures 16, 17 and 18 illustrate three-way intersection junction box, with fibre base and cover.

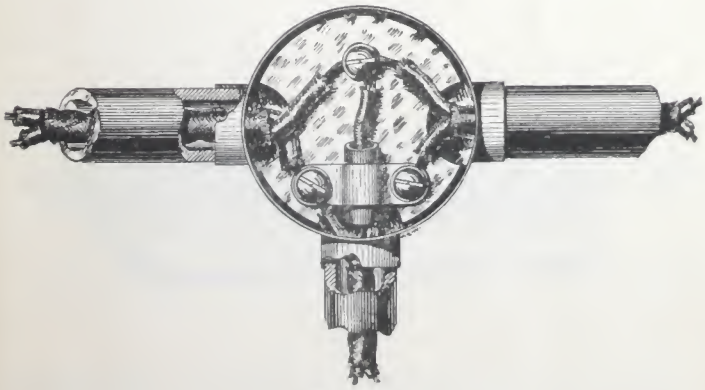


FIG. 19.

Figure 19 illustrates the interior of Figure 16 containing figure 17, with the conductors connected.

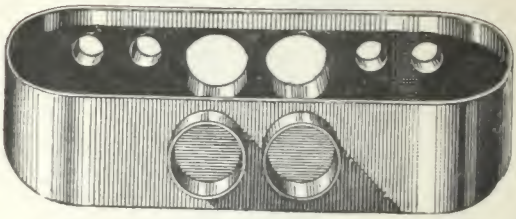


FIG. 20.

(Two Wire, Four Circuits.)

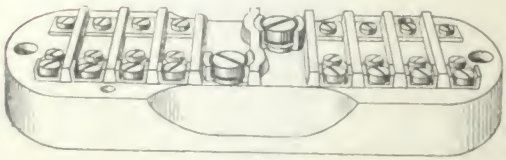


FIG. 21.

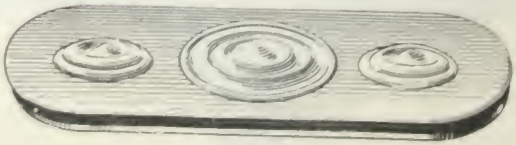


FIG. 22.

Figures 20, 21 and 22 illustrate a main junction box, with porcelain cutout and cover

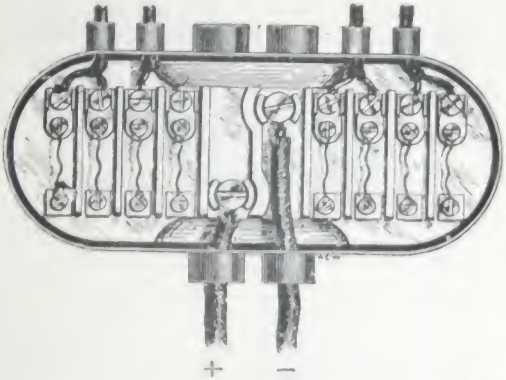


FIG. 23.—Illustrates the main junction box with the main and branch circuit wires connected and the safety fuses in position.

FIG. 24.—Illustrates a section of conduit containing wires for branch circuit.

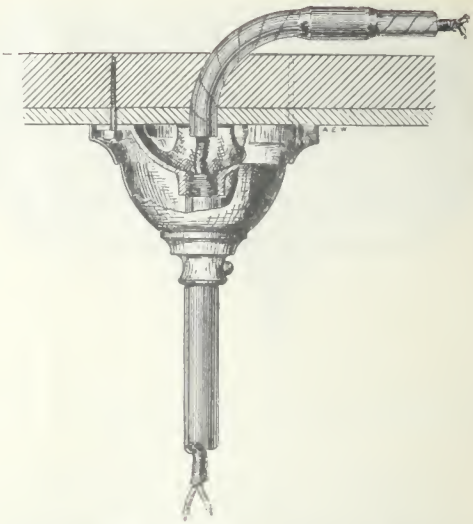


FIG. 25.—Illustrates the use of elbow in conveying wires to single centre outlet at end of circuit.

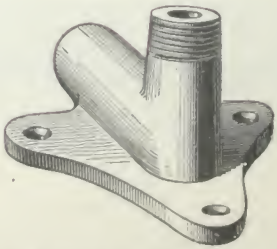


FIG. 26.—Illustrates side outlet as arranged for bracket lamp.

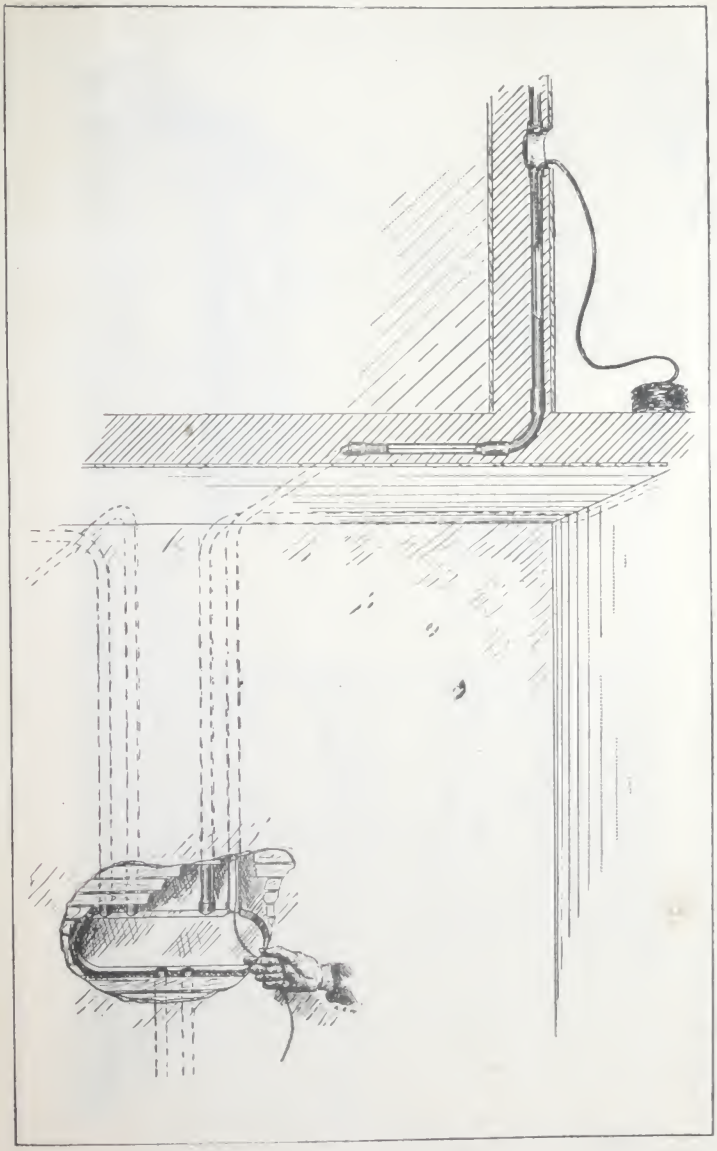


FIG. 27—Illustrates the method of drawing the conductors through the conduit by means of the fishing wire.

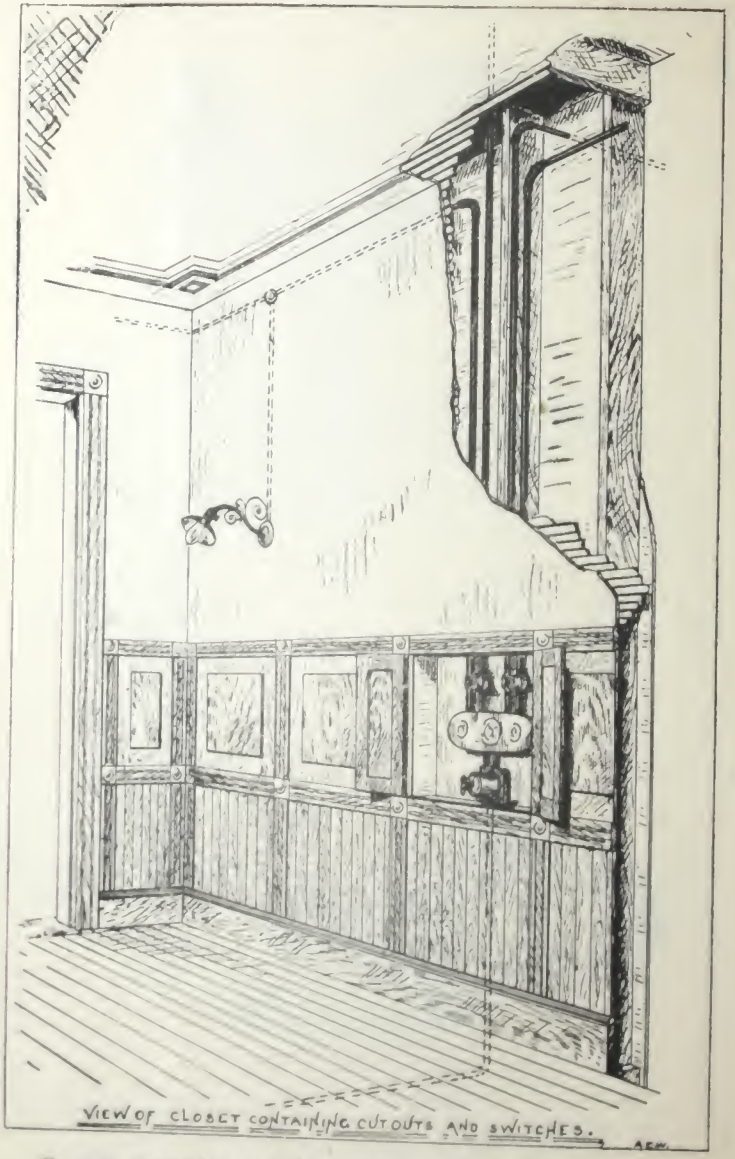


FIG 28.—Illustrates the method of placing conduits with junction box and switches placed in panel in wainscott.

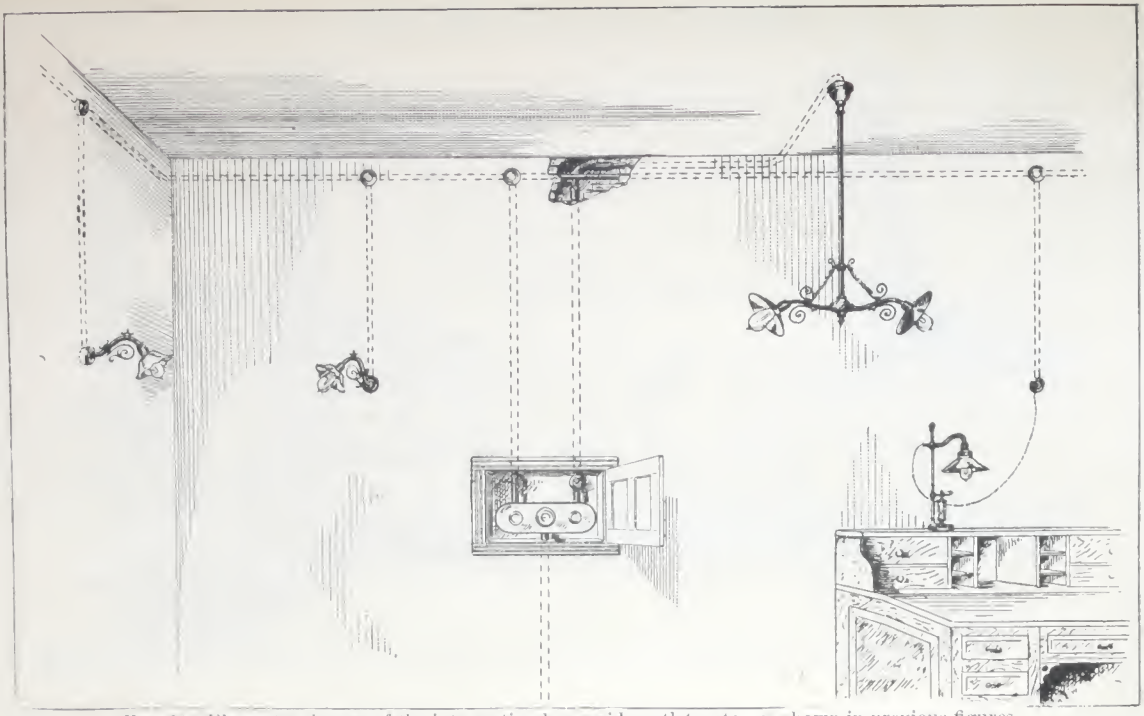


FIG. 29—Illustrates the use of the intersection boxes side outlets, etc., as shown in previous figures.

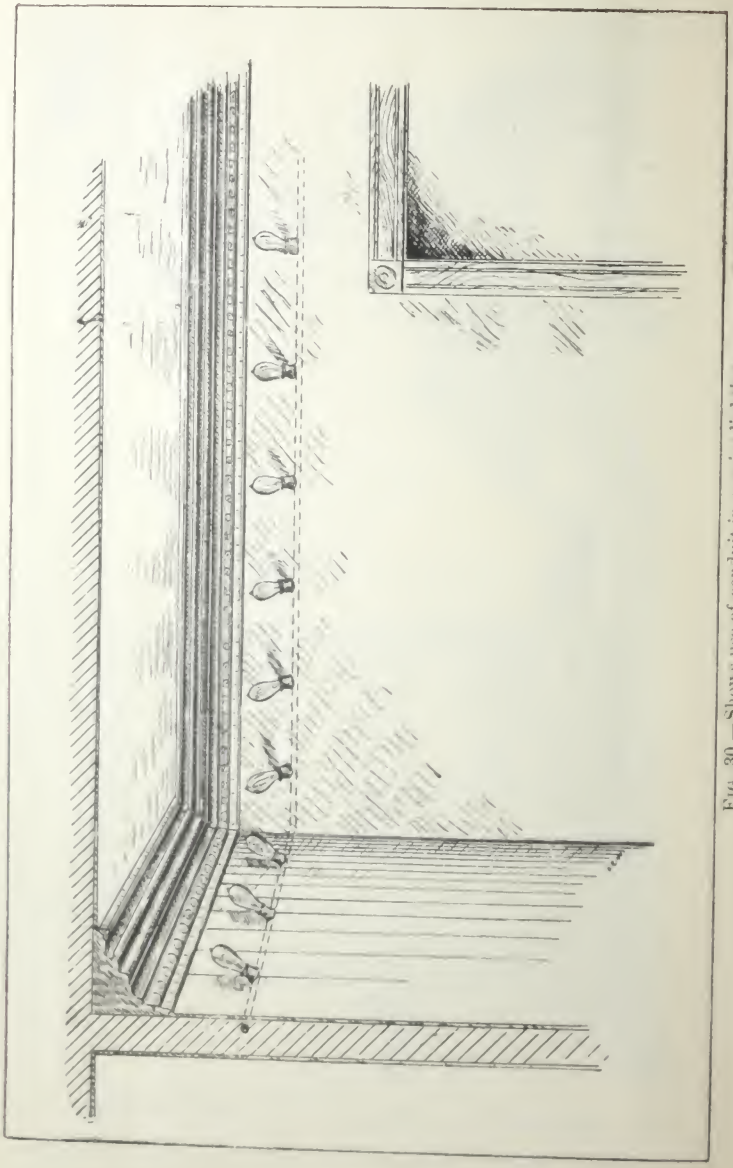
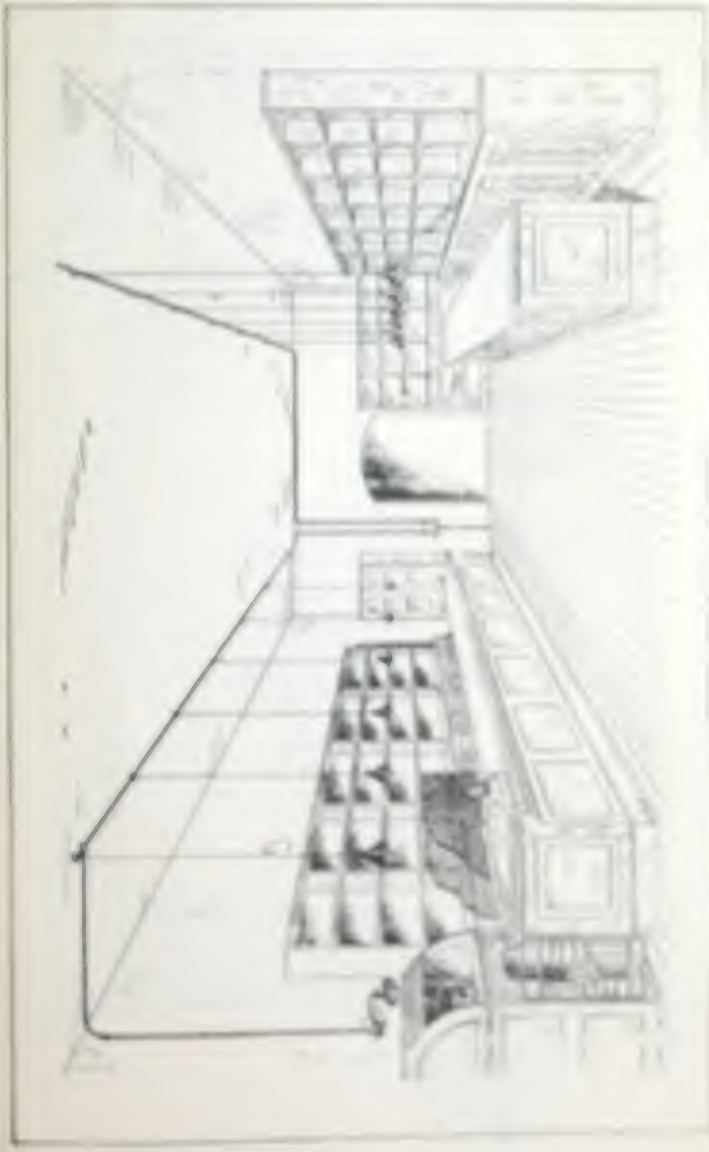


FIG. 30.—Shows use of conduit in cornice lighting.



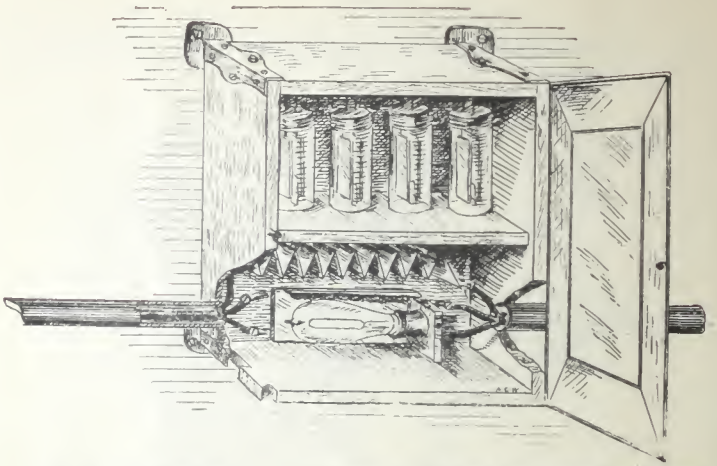


FIG. 32.—Illustrates the conduits used in carrying the wires to and from the meter.

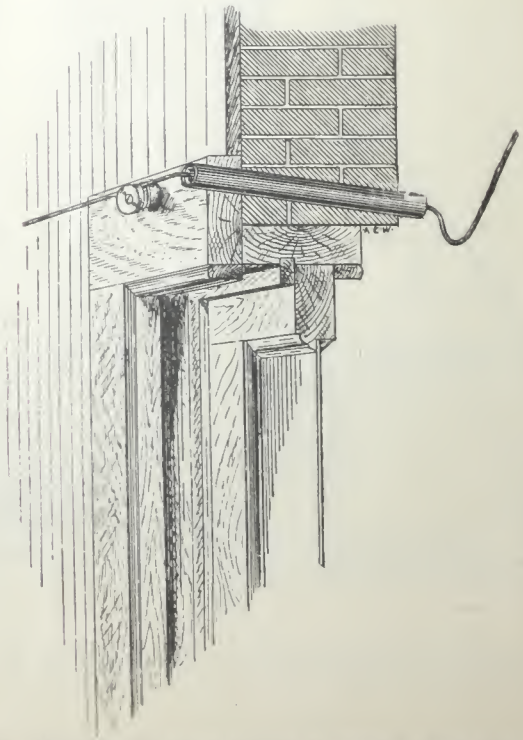


FIG. 33.—Illustrates the use of conduit in carrying wires into a building from a pole outside.

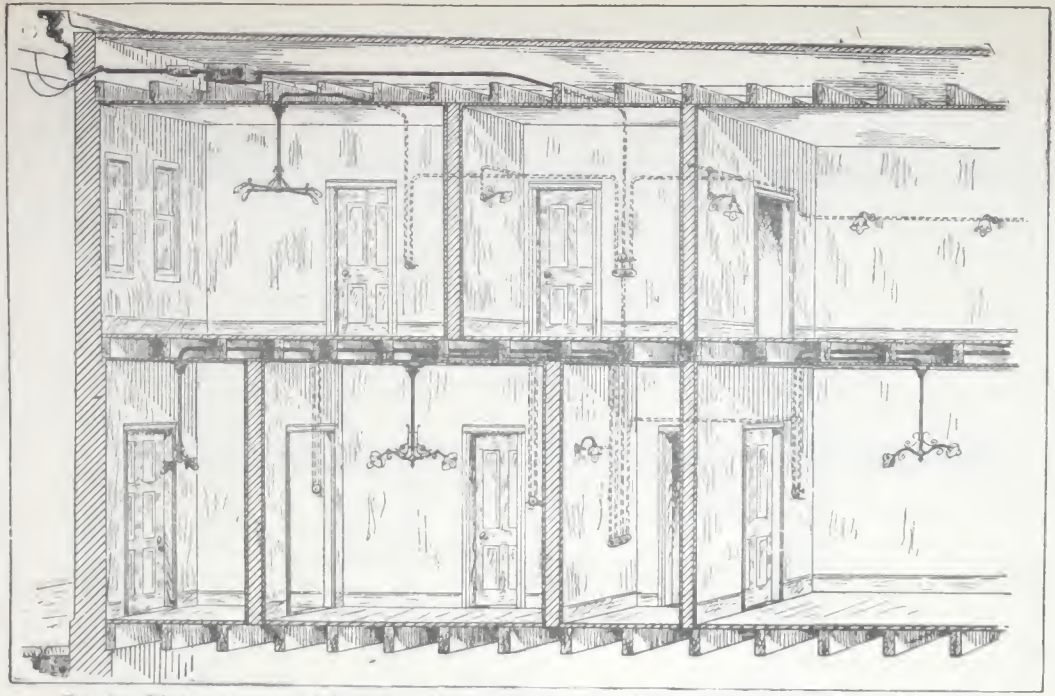


FIG. 34—Illustrates the conduit used as shown in figures 32 and 33, and the distribution of the system; the wires being taken from pole line.

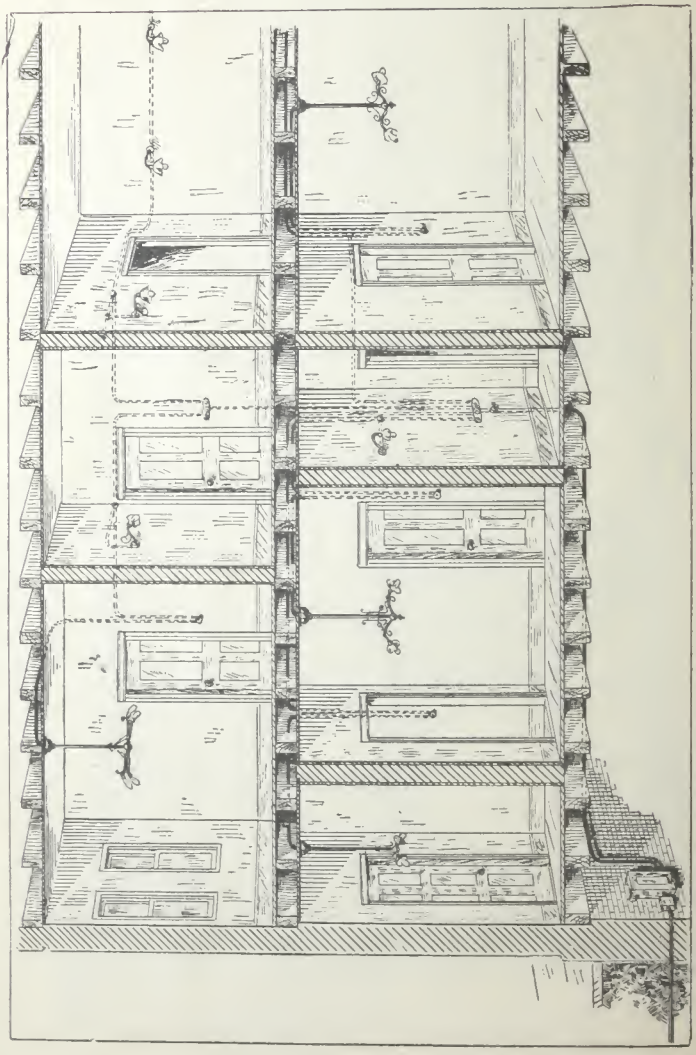


FIG. 35—Illustrates use of Conduit as shown in figures 33 and 34; wires coming from under ground conduit.

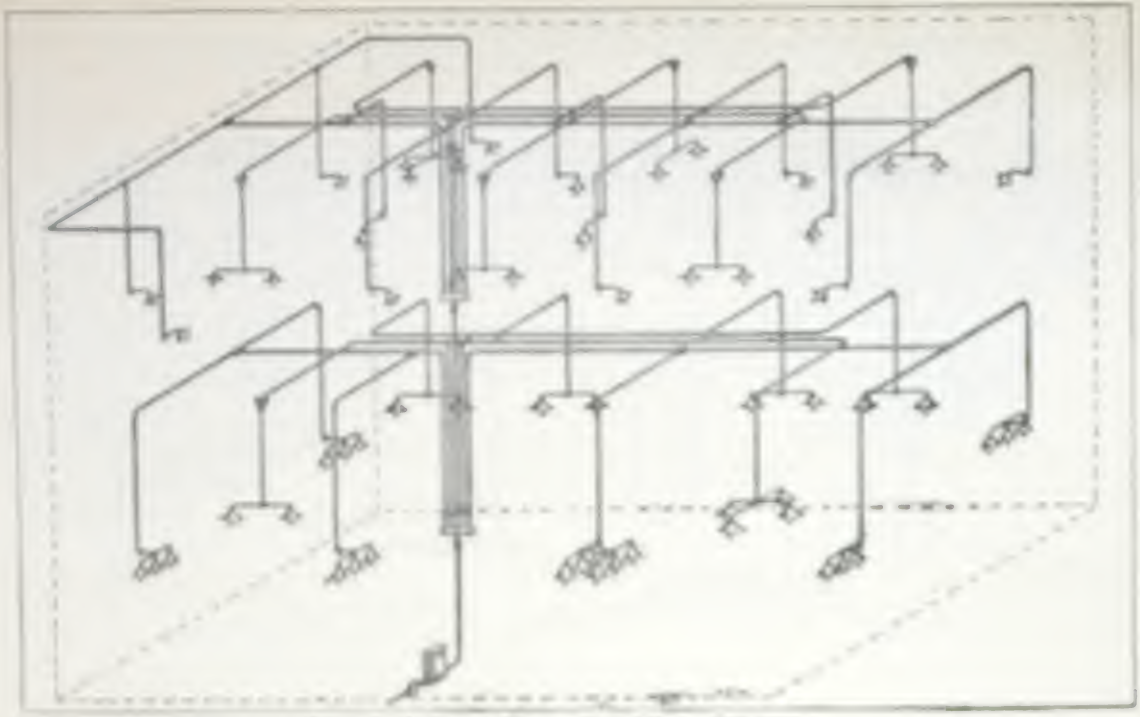


FIG. 37.—Illustrates the use of Conduit under ground. In this case it is placed in a wooded box and surrounded with pitch or asphalt.

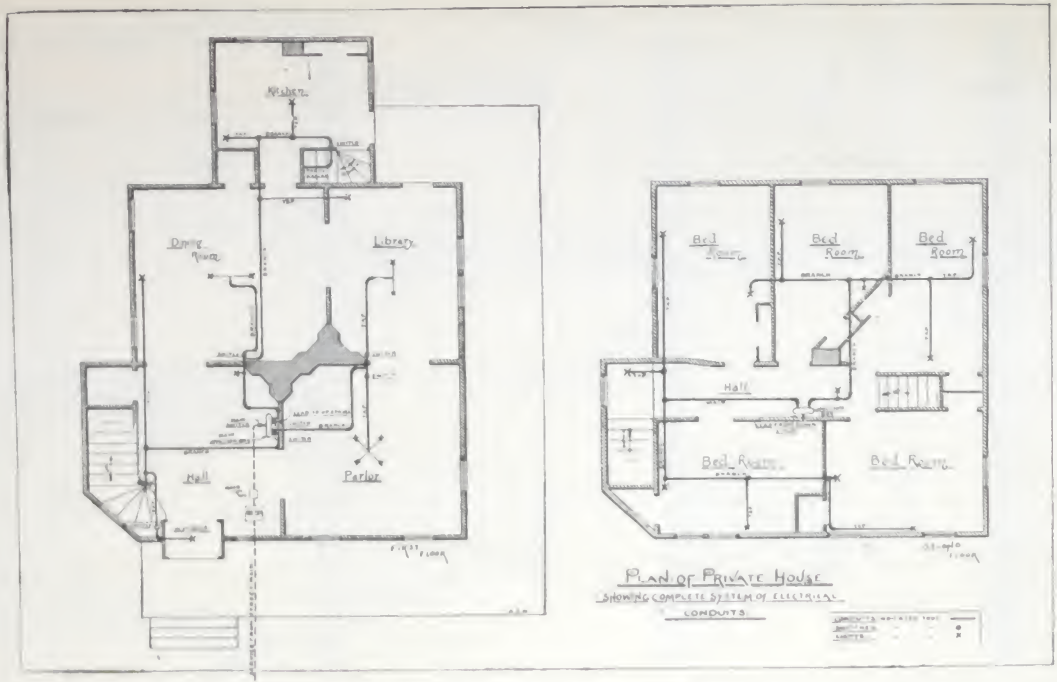


FIG. 38.—Illustrates plans of house with the conduits laid out showing an outlet and lights for each room.

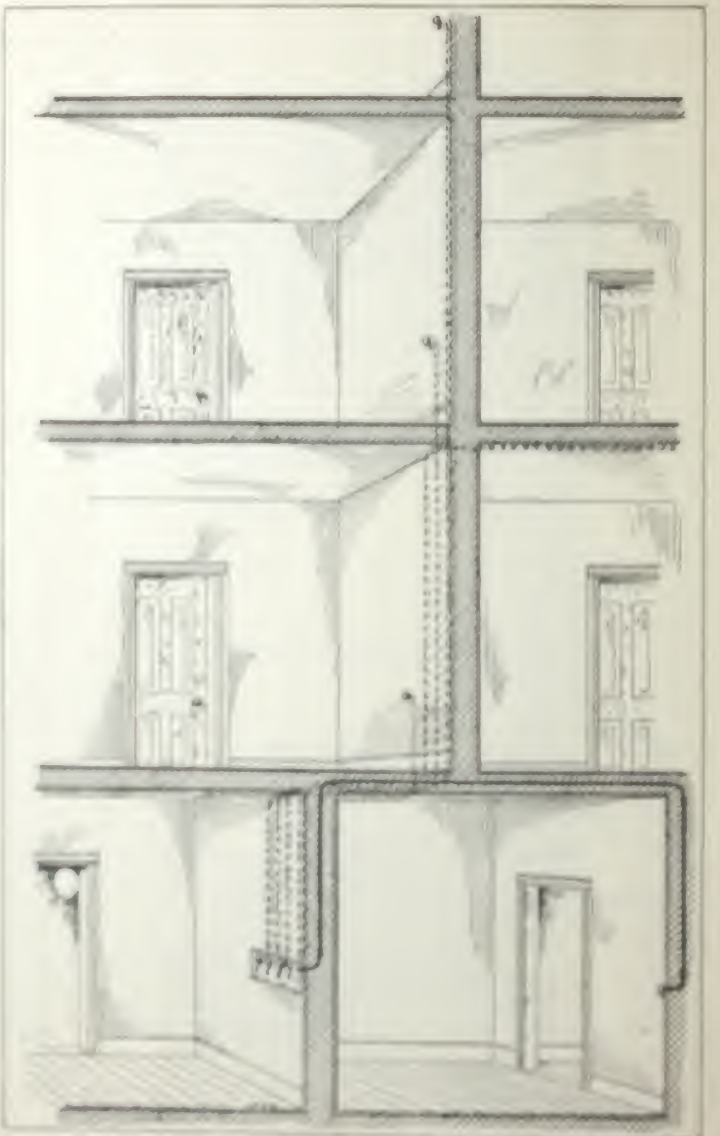


Fig. 20.—Illustrates the Conduits. Wire, 1 inch, used as speaking tubes.

LIST OF BUILDINGS EQUIPPED WITH THE INTERIOR ELECTRICAL CONDUITS.

—o—

Metropolitan Telephone & Telegraph Building, 38th Street, New York.

Union Trust Co.'s Building, Broadway, New York.

J. P. Morgan's Residence, New York.

Wm. Rockefeller's Residence, Tarrytown, N. Y.

Park Presbyterian Church, 86th St. & Tenth Ave., New York.

Elihu Thompson's Residence, Lynn, Mass.

F. R. Upton's Residence, Orange, N. J.

E. W. Candee's Six Houses on 57th St., N. Y. City.

Rockville Town Hall, Rockville, Conn.

Shoe & Leather Exchange, Boston, Mass.

Osgood Welsh's Residence, 30 W. 16th St., New York.

Levi P. Morton's Shoreham Apartment House, Washington, D. C.

Mrs. M. Janin's Residence, 20 East 35th St., New York.

Lincoln Safe Deposit Vaults, 42d St., New York.

Geo T. Baker's Residence, 256–8 Madison Ave., New York.

Public Buildings, Philaadelphia, Pa.

Farmer's Loan and Trust Co., N. Y.

Goodwin Apartment House, Hartford, Conn.

Clun Studebocke's Residence, South Bend, Ind.

E. D. Morgan's Residence, Newport, R. I.

E. H. Johnson's Residence, Greenwich, Ct.

New "World" Building, N. Y. City.

Broadway Hotel, 32d St., N. Y. City.

St James' Lutheran Church, N. Y. City.

RULES AND REQUIREMENTS

OF

BOSTON FIRE UNDERWRITERS' UNION

AND

NEW ENGLAND INSURANCE EXCHANGE

FOR

INTERIOR & CONCEALED ELECTRIC LIGHT INSTALLATION

Supplemental to, and Superseding Rules issued May 15, 1889, so far as relates to inside and Concealed Wiring.

FORM A. ARC SYSTEM, INSIDE WIRES.

16. Wires must not be concealed, and they must be rigidly kept apart at least one foot, unless an *appoved moisture-proof, non-conducting, non-inflammable tubing* is used. This tubing must be sufficiently strong to protect the wires from mechanical injury. It may be fastened to the wall by staples, provided the tubing is not broken or injured thereby. Wires in this class of tubing may be run as near as three inches to each other.

17. In perfectly dry places wires may be supported by wooden cleats ("filled" to prevent absorption of moisture), or porcelain. A cleat having a backing so as to separate the wire at least one-fourth inch from the building must be used.

18. In places liable to dampness, wires must be thoroughly and carefully run on glass insulators, rubber hooks, or porcelain knobs of suitable size or shape, and the wires must be separated at least eighteen inches. They must also be provided with an approved water-

proof insulation, or encased in an approved tubing. If encased in such approved tubing, the distance may be reduced to three inches.

19. When wires pass through walls, floors, partitions, timbers, etc., in-doors, glass tubing or so-called "floor insulators," or other moisture-proof, non-inflammable, insulating tubing must be used.

FORM E. INCANDESCENT SYSTEM, INSIDE WIRING.

21. Wires laid in plaster, cement, or other similar finish will not be approved, no matter what insulating covering is used. An approved moisture-proof, non-inflammable, insulating tubing or conduit may be used in such places. This tubing must be of sufficient size and so placed that the wires may be withdrawn and replaced at will. A separate tube must be laid for each wire, except in the case of "taps" for not more than fifteen amperes, in which case conductors having only a cotton insulation separating them will be required. If a moisture-proof covering is desired, it must be placed outside the two conductors and not between them. In other concealed places, such as unfinished lofts, between floor and ceiling, in partitions, etc., all wires must be kept *absolutely* free from contact with any part of the building and must be supported upon glass, porcelain or other non-combustible insulators, with at least one inch clear air space secured, and they must be kept at least ten inches apart when possible, and should be run singly, on separate timbers or studding. In lieu of such construction an approved moisture-proof, non-inflammable, insulating tubing or conduit will be accepted. Tubes of such approved make may be laid side by side when embedded in plaster, or otherwise. Unless such tubing is used care must be taken to keep the wires away from metal pipes or other conductors. In insulating tubing, wires must have a non-inflammable insulating covering and they should be flexible. At all outlets to and from cut-outs, switches, fixtures, etc., wires must be separated

from gas-pipes or parts of the building by porcelain, glass, or other non-inflammable insulating tubing, and should be left in such a way as not to be disturbed by plasterers. Wires of whatever insulation must not in any case be taped or otherwise fastened to gas-piping. If no gas-pipes are installed at the outlets, an approved substantial support must be provided for the fixtures.

21½. The wiring of any building must be so calculated that there will be no loss greater than three per cent. for the total number of lamps to be used, when supplied from central stations, or eight per cent. if an isolated plant. A separate set of vertical mains must be installed for each floor; the lower ends of these feeders to terminate at the switchboard, if it be an isolated plant, or at the point of entrance if current is supplied from outside. Private dwellings are exempted from this rule.

24. In dye-houses, paper and pulp mills, and other buildings specially liable to moisture, all wires (except those used for pendants) must be separated at least six inches. The wire must be thoroughly and carefully put up, and must be supported by glass or porcelain insulators, or by rubber hooks. An approved moisture-proof, non-inflammable, insulating tubing will be accepted in lieu of such construction.

26. When wires pass through walls, floors, partitions timbers, etc., in-doors, glass tubing or so-called "floor insulators," or other moisture-proof, non-inflammable, insulating tubing must be used.

38. This section so amended as to require all switches and cut-outs to be made of non-combustible material.

40. Is stricken out in consequence of the amendment of section 38.

75. The running of wires for electric gas lighting on the same fixtures with electric lighting, *will not be approved*.

Boston, Mass., January 1, 1890.

[From the *Electrical World* of November 30th, 1889.]

THE ART OF INTERIOR WIRING.

One of the most remarkable features of the introduction of the electric light has been the manner in which its progress has paralleled that of gas, in the early days. When gas was first brought to public notice, it was tried in one or two buildings; then a street or two was lit up, and soon it became popular for large stores and public buildings as well as for streets. But it was a longer time finding its way into dwellings, partly because of a fear as to its danger and largely because the method of putting in the service pipes was crude and bad. At last piping was brought down to a science, and since then gas has been in universal use. The electric light has gone, and is going, through exactly the same stages, and in ten years has reached the point that gas has hardly touched in fifty. One of the main things to-day is the improvement of the methods of interior wiring, and it may be broadly affirmed that this part of the work is as important as that connected with systems of generation. We are glad to be able to present a fully illustrated description of some recent advances in the art of interior wiring, in which the wires are carried throughout a building in definitely located tubes. We do not hesitate to express our conviction that the methods thus developed and perfected are destined to have a remarkable effect on the introduction of electric lighting, and that the merits of safety, convenience, permanence, and provision for the future will be appreciated quickly and enthusiastically. With such a system ready at hand, no electrician should now allow a single private house or public building of any pretensions throughout the country to be finished without being equipped with its interior conduits, so that at the earliest possible moment the wires may be introduced and the current turned on to the lamps.

[From the *Boston Herald*, Dec. 16th, 1889.]

ELECTRICAL CONDUITS.

How the Lighting Wires of the Future are to be Housed.

"Until a very recent date," said an electrician to a HERALD man a few days ago, "the methods of introducing electric circuits for incandescent lighting in dwelling houses and public buildings have been crude and barbarous. The dynamo has been brought to the highest state of efficiency, the lamp has a longer life and a greater brilliancy than ever, the arrangements for carrying the current all over a large district are quite successful; and yet the details of interior wiring are frequently such that it is a wonder how the light has survived in spite of them. Generally the wires are not in sight, but are laid in the plaster, and to get at them involves the destruction of walls and woodwork. This is all primitive. So are the cleats and mouldings that disfigure handsome apartments in which the incandescent lamp is used. Some better method of shielding the wires must exist. It has been found, indeed, and it bids fair to supplant the original methods of wiring as completely as gas apparatus has usurped the place of kerosene lamps. The new system is an outgrowth of advancement in electrical science as much as is the practice of burying wires underground. It consists of running wires through a building by means of conduits or tubes very much like ordinary gas or water pipes, which serve as ducts or repositories for the distributing wires. The wire used in this system is adequately insulated, besides being completely protected by the conduits. These tubes are made of a substance somewhat similar to papier-mache. After the material has been made by a special process, it is subjected to a treatment with a bituminous or asphaltic compound that renders it thoroughly non-conducting and impervious to moisture. The tubing is made in sizes of $\frac{1}{4}$ inch

to $1\frac{1}{4}$ inches, inside diameter, and in lengths of 10 feet. These lengths are joined together by sleeve couplings, and are fitted with elbows for rounding curves and corners. Within such a tube, running through a building to every point where an incandescent lamp is needed ordinary wire might be used without great danger, but in order to insure absolute safety against the effects of short circuits and superheated wires, every circuit is provided with a fuse, and so arranged that any trouble of this sort must instantaneously declare itself and disappear without having any chance to set fire to surrounding material in the walls. All the conduits issue from a main junction box placed as near as possible to the centre of distribution of the illuminating currents.

If a particular circuit is out of order it is only necessary to go to the main junction box to locate and remedy the trouble. The tubing is also fitted with smaller junction boxes, intersection boxes and outlet terminals, for every individual light, which make ample and elegant provision for the ramifications and convenience of the service. Without understanding a great deal about electrical science anybody can appreciate the safety of this system of housing the wires. It is, moreover, extremely convenient. Every architect knows how to dispose of pipes in his plans. He has something definite to deal with. He can carry the whole system in his mind before putting a line on paper. He can follow out every part of the distribution in a systematic way, and, instead of being repelled by the difficulties of electric lighting, he is encouraged to make ingenious plans that shall fit the requirements of the case. Again, any interference with decorations is avoided. If a building is electrically conduited, there can be no vandalism in tearing down woodwork, breaking into walls or ruining choice frescoes or papers. To introduce or remove wires from the conduits is almost as easy as to pass a current of water through a system of pipes. A common practice in wiring large buildings has been to adopt the

circulation" method, which consists, broadly speaking, in running the main conductor clear through from the dynamo to the last floor, and taking off a feeder at each floor to supply the lamps. Not a little difficulty ensues when testing trouble in the work becomes necessary, for the location of the controlling points in the system is always a matter of more or less uncertainty. Not so, however, with the "distribution" method employed with conduits. Here the various parts fall into their places like the different divisions of a well organized machine.

The "distribution" idea is to wire to the centres, or distributing points, midway in the installation, so that starting with the main feeders, the whole system, down to the last lamps, is one of equalized pressure and perfect balance. The junction boxes, switches and cut outs find convenient places on each floor, under lock and key if desired, but as easy to reach as the water cooler or hatrack. The conduit system is likewise one that admirably provides for the future. Every inch of wire can be drawn out and in, easily and at any time, and the carrying capacities of the circuits may be increased in accordance with the requirements of a tenant or any other exigency that may arise. Again, new buildings at a considerable distance from centres of supply can be furnished with interior conduits, and thus be placed in condition to receive the wires without delay when the boon of incandescent lighting is within reach. If the practice of conduiting new dwelling houses, just as they are now fitted with gas pipes, becomes at all common—and there seems to be a probability that it will—incandescent lighting will surely become much more popular than it now is in private buildings. The conduit system has only recently been perfected. Although it appears at first sight very simple, it was the subject of years of study and labor before all the difficulties of insulation and distribution were surmounted. In Boston there are not many build-

ings provided with the conduits. The latest to be improved by these electricity pipes is the new building of the Shoe and Leather Exchange, on Bedford street, directly opposite to the big building that was burned in the fire of Nov. 28.

[Editorial the *Electrical World*, Dec. 7th, 1889.]

THE FIRE IN BOSTON.

Boston was devastated last week by a fire of serious proportions, and one of the first developments was an attempt to put the blame on the electric wires. No evidence that the wires caused the fire has yet been produced, but we are gravely informed that because one or two wires of the time system were burnt out suddenly, therefore the fire started in that way. It is just as reasonable to argue that the fire itself caused the time wires to break, and to cross other wires. Until more evidence is produced, it will certainly not be accepted as proven that the fire was of electric origin. It is, however, worth while remarking that the event gives signal proof of the value of the special form of conduit, to which we drew attention last week, for interior wiring. If wires, carried into a building, with fuses, were taken through such a tube, the fire danger would be brought down to the narrowest limitations, and it would no longer lie in the power of sensational reporters or irresponsible fire marshals to say, simply because it is an easy way out and fashionable, that an electric wire caused the trouble. We have ourselves seen experiments in the way of trying to start a fire in the tube that convince us of its great merits in this particular respect, as a safeguard that would not break down.

[Editorial *Boston Daily Globe*, Dec. 10th 1889

A NEEDED PRECAUTION.

In the present general use of electricity one thing is absolutely essential, and that is safety in its use. There is little doubt that the great fire in this city arose from electricity. When wires are led into buildings they should be rendered absolutely safe. They are not safe now. They are, if insulated at all, only slightly covered with paraffined cotton or rubber, which a too heavy current burns off. The arc light wires, if the insulation is slightly worn, are especially dangerous.

There is a method by which telegraph, telephone, electric light, call-box or electric time wires can be rendered safe. This method is to run them through what is known as an interior electrical conduit, made of absolutely fireproof material. Being inside this fireproof tube the wires might fuse and still there would be no danger.

This idea has just come into existence in New York, and, after severe tests, has been found to answer the purpose. It should be adopted in Boston before another costly fire adds emphasis to the lesson already taught.